REMARKS

I. The 35 U.S.C. §103 Rejections

(i) claims 1-4, 6-8 and 19

Claims 1-4, 6-8 and 19 were once again rejected under 35 U.S.C. §103(a) based on the combination of U.S. Pat. No. 4,344,477 to Miki et al ("Miki") in view of U.S. Pat. No. 5,040,589 to Bradley et al ("Bradley"). Applicants respectfully disagree and traverse these rejections for at least the following reasons.

(i) The combination of Miki and Bradley does not disclose or suggest cooling a heated metal slurry to form a contact area that provides *a substantially continuous void free interface* between a core object and fins.

As the Applicants have stated before, neither Miki nor Bradley, taken separately or in combination, disclose or suggest the feature of cooling a heated metal slurry to form a contact area *that provides a substantially continuous void free interface* between the core object and fins when hardened for effective heat transfer across a contact area, as in claim 1.

In rebuttal, the Examiner again appears to acknowledge that neither Miki nor Bradley explicitly discloses the formation of a substantially continuous void free interface. Nonetheless, the Examiner appears to take the position that such a combination implicitly discloses or suggest such a feature

because the combination of Miki and Bradley "...is expected to form the fins substantially simultaneously and to have a substantially void free interface between the core and the metal slurry since the semi-solid slurry of Bradley is also injected into the mold cavity of Miki to unite the core perform".

The Examiner does not provide any evidence or support for such an "expectation". Nor is there any, other than the disclosure in the instant application which, as the Examiner knows well, cannot be used to reject the claims.

The Examiner also appears to have ignored the words *substantially void free interface* based on the rationale that the word "substantially" is an impermissible "qualitative expression". Applicants disagree.

When a word of degree, such as "substantially", is used in a claim the Federal Circuit has stated that the USPTO must determine whether the specification provides some standard for measuring that degree. In particular, the USPTO must decide whether one of ordinary skill in the art would understand what is claimed when the claim is read in light of the specification (see for example, *Seattle Box Company, Inc. v. Industrial Packing, Inc.,* 731 F.2d 818, 826, 221 USPQ 568, 573-74 (Fed. Cir. 1984)). Further, even though the word "substantially" may sometimes be imprecise, when it is used in conjunction with another phrase to modify such a phrase, its imprecision

cannot be allowed to negate the meaning of the phrase it modifies (see for example, *Ex parte DANIEL J. BONNER*, Appeal No. 1998-1454 (BPAI, October 18, 1999) and *cases* cited therein).

Here, the use of the word "substantially" was intended to indicate that almost all of the "air voids" (see page 2, lines 16-20 of the instant specification) in a contact area between a core object and fins are removed by the cooling step in claims 1 and 9; it was not intended to broaden the scope of the phrases "cooling area" or "void free interface" and does not otherwise negate the meaning of these phrases.

In sum, the Applicants submit that the Examiner has impermissibly ignored the phrase "substantially void free interface" in rejecting the claims because such a phrase would be understood by one of ordinary skill in the art.

When this phrase is properly considered the Applicants submit that the subject matter of claim 1 would not have been obvious to one of ordinary skill in the art at the time the application was filed based on the combination of Miki and Bradley.

Further, the Applicants submit that due to the known, markedly different chemical and physical properties between a semi-solid and a liquid metal one of ordinary skill in the art would <u>not</u> expect that combining Bradley and Miki would result in the formation of a contact area that provides a

substantially continuous void free interface between a core object and fins (hereafter referred to as the "claimed invention" for the sake of brevity only). To the contrary, it is likely that one of ordinary skill in the art would recognize that many parts, components and specifications of Miki and Bradley would have to be changed--- from the diameter of Miki's tubing, to temperatures and pressures, to the specific process and steps employed in both Miki and Bradley. Further, without question such a skilled artisan would recognize that Miki's process was not designed for semi-solids and appears to operate at a higher casting temperatures then the melting point of Bradley's semi-solids (*compare* Miki, col. 7 at Table 1, with Bradley, col. 6 ln 17-21.), all of which would most likely lead one of ordinary skill in the art to expect that the combination of Miki and Bradley would not result in the claimed invention.

Indeed, the Applicants respectfully submit that it is doubtful that one of *extraordinary* skill in the art would have expected the combination of Miki and Bradley to result in the claimed invention.

Paraphrasing the BPAI in *Ex parte Armitage* (Appeal No. 2008-004803, decided September 4, 2009, page 10) the Applicants submit that "even an artisan possessing creativity and common sense, and having knowledge of" methods of injecting semi-solid slurries into a casting die would not have reasonably combined Miki and Harvey "in the manner suggested by the

Examiner, but for having the benefit of the instant claims to impermissibly use as a guide."

(ii) The combination of Miki and Bradley is impermissible

As the Applicants have stated previously, and reiterate here, the combination cited by Examiner is impermissible because such a combination would render one or both of the references unsatisfactory for its intended purpose. The Applicants believe that one of ordinary skill in the art would recognize that it would be impractical to combine the two processes as the Examiner has suggested to arrive at the claimed invention at least because Miki's process is incompatible with the lower temperature and pressure requirements of Bradley.

To begin with, one skilled in the art would recognize that the thixotropic slurry of Bradley has a higher viscosity than the molten metal of Miki (*see*, e.g., the paragraph bridging columns 13-14 of Bradley). Because of this difference in viscosity one skilled in the art would have been discouraged, not encouraged, to combine Miki and Bradley to create a substantially continuous void free interface, as set forth in the claims.

Said another way, in order to combine the two references at least Miki would have to change its principle of operation in order to operate using the higher viscosity, thixotropic slurries of Bradley. Such a change is impermissible

because it would render Miki unsatisfactory for its intended purpose of operating using molten metals.

Miki and Bradley appear directed at two different and incompatible processes. For example, in Miki a "pressure resisting medium" is injected into the interior of a hollow member together with movable plugs so that high temperature and high pressure injection of molten metals can be completed without deforming the hollow member (*see* Miki at col. 2 ln 27-51). In contrast, Bradley does not require the use of a pressure resisting medium because Bradley first converts pellets of feed stock to a semi-solid state (*see* Bradley, col. 4 ln 19) and then uses a screw extruder to inject semi-solid material apparently at a *minimum* of heat and pressure (*see* col. 4 ln 12-39, and Fig. 2). One skilled in the art would recognize that, to combine the two references would require Bradley to change its principle of operation to incorporate Miki's hollow member, together with movable plugs; this is impermissible.

In rebuttal the Examiner appears to rely on newly cited U.S. Patent No. 5,433,511 to Wei ("Wei") for the proposition that it is "a common practice to inject either molten metal or semi-solid into a mold cavity to form a cast article" (*see* Office Action, page 5).

Initially, the Applicants respectfully request clarification of the Office Action. In particular, the Applicants request that the Examiner indicate

whether the Examiner is rejecting claims 1-4, 6-8 and 19 based on the combination of Miki, Bradley and Wei.

For the purpose of Applicants' present response, the Applicants will presume that the Examiner is rejecting the claims based on the combination of all three references.

The Examiner's reliance on Wei appears to be misplaced. The subject matter of Wei appears to be directed to casting materials that are *combinations* of metal alloys, formed from a metal matrix composite specifically including a variety of *nonmetallic* reinforcing material (*see* Wei, col. 2 ln 26-29).

One of ordinary skill in the art would recognize that, as explained in detail above with respect to Miki and Bradley, choosing a casting process depends to a great extent on the type of material being cast. In particular, on the chemical and physical properties of the material. Because Wei's materials are markedly different than the materials used in either Miki or Bradley, such a skilled artisan would recognize that combining Miki, Bradley and Wei would no doubt require one or more of these references to change their principle of operation; which, as the Examiner knows is impermissible.

The Examiner also appears to rely on newly cited U.S. Patent No. 6,151,198 to Prater ("Prater") for the proposition that the "potential benefits that could result from forming processes utilizing semi-solid metal [to]

differentiate these processes from conventional casting" (*see* Office Action, page 5) would "further motivate those of ordinary skill in the casting art to use the semi-solid Mg alloy of Bradley et al as a casting material in the process of making heat exchanger [sic] of Miki et al" (*see* page 6).

As with Wei, the Applicants respectfully request clarification of the Office Action. In particular, the Applicants request that the Examiner indicate whether the Examiner is rejecting claims 1-4, 6-8 and 19 based on the combination of Miki, Bradley, Wei and Prater.

For the purpose of Applicants' present response, the Applicants will presume that the Examiner is rejecting the claims based on the combination of all four references.

Whether benefits flow or not from processes utilizing semi-solid metals is not determinative of whether one skilled in the art would have combined some combination of Miki, Bradley, Wei and Prather to arrive at the claimed invention in light of the substantial difficulties in doing so, some of which are discussed above.

Accordingly, the Applicants submit that the subject matter of claims 1-4, 6-8 and 19 would not have been obvious to one skilled in the art at the time the application was filed based on the combined disclosures of Miki, Bradley, Wei and Prather.

The Applicants respectfully request withdrawal of the rejections and allowance of claims 1-4, 6-8 and 19.

(ii) claims 9-12, 14-16 and 20

Claims 9-12, 14-16 and 20 were rejected under 35 U.S.C. §103(a) based on the combination of Miki, Bradley, and Japanese reference JP 6-292,944 ("944 reference"). Applicants respectfully disagree and traverse these rejections for at least the following reasons.

In their previous response the Applicants noted that the Examiner had not articulated how Miki and Bradley were being applied to claims 9-12, 14-16 and 20 (i.e., what features are purportedly disclosed by Miki? by Bradley?). In response, it appears that the Examiner has still not articulated what features of claims 9-12, 14-16 and 20 are disclosed by Miki and/or Bradley. Therefore, the Applicants submit that the Examiner's stated rationales are insufficient to support a *prima facie* rejection under U.S.C. §103(a). Accordingly, the Applicants request that the Examiner clarify the rejections in the Advisory Action or else withdraw the rejections.

The brief rationale supplied by the Examiner focuses on the '944 reference. The Examiner states that the '944 reference "show to [sic] continuous cast articles by using a continuous casting machine, which

consists of two series of die plates, such that to speed up the casting process". This rationale is essentially the same one set forth by the Examiner in a previous Office Action, though now relied on to support the addition of the '944 reference.

Presumably the Examiner's rationales for applying Miki and Bradley are the same as in claims 1-4, 6-8 and 19. Accordingly, similar to the rationales set forth above, neither Miki nor Bradley, taken separately or in combination, discloses the feature cooling the heated metal slurry to *form a contact area that provides a substantially continuous void free interface* between a core object and the fins when hardened for effective heat transfer across the contact area, as in claim 9. Nor does the '944 reference make up for the deficiencies in Miki and Bradley.

In addition, the combination of Miki and Bradley is impermissible as discussed above.

In their previous response the Applicants noted that because the '944 reference is in the Japanese language it is not possible for the Applicants to determine at this time whether the combination of the '944 reference, Miki and Bradley is permissible, i.e., whether such a combination of references would render one or more of the references unsatisfactory for its intended purpose or

impermissibly require one or more of the references to change their principle of operation.

More specifically, while the Applicants thanked the Examiner for providing an English translation of the Abstract of the '944 reference, the Applicants stated that the Abstract does not provide enough detail. The Applicants pointed out, for example, that the translated Abstract does not discuss pressures or temperatures. Thus, the Applicants cannot yet determine whether the pressures or temperatures discussed in the '944 reference are suitable to be used at the pressures and temperatures disclosed in Miki and Bradley without destroying the structural integrity of the apparatus discussed in the '944 reference. The Applicants then respectfully requested a full translation of the '944 reference in the next Office Action.

To the Applicants knowledge no translation has yet been sent to the Applicants. The Applicants request that the Examiner indicate in the Advisory Action whether or not the Examiner has sent a translation to the Applicants. If not, the Applicants may need to order one for any appeal, if necessary.

In response the Examiner states that the '944 reference "is cited simply to show that it is conventional to use a caterpillar type continuous casting machine for continuous casting metallic article, in lieu of conventional batch-wise casting process, to speed up output" (*see* page 6). While the Applicants

appreciate this explanation it does not help resolve the issue of whether, for example, the pressures or temperatures discussed in the '944 reference are suitable to be used at the pressures and temperatures disclosed in Miki and Bradley without destroying the structural integrity of the apparatus discussed in the '944 reference, thus rendering the combination of Miki, Bradley and the '944 reference unsatisfactory for its intended purpose (i.e., an impermissible combination).

In conclusion, for all of the above reasons the Applicants respectfully request withdrawal of the rejections and allowance of claims 9-12, 14-16 and 20.

II. Entry of Request for Reconsideration

Entry of this Request for Reconsideration ("Request") is solicited because the Request: (a) places the application in condition for allowance for the reasons discussed herein; (b) does not raise any new issues requiring further search and/or consideration; (c) does not present any additional claims without canceling the corresponding number of finally rejected claims; and (d) places the application in better form for appeal, if an appeal is necessary.

In the event that there are any outstanding matters remaining in the present application, the Examiner is invited to contact John E. Curtin at 703-266-3330 to discuss this application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 50-3777 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Very truly yours,

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